SPECIFICATION
FOR EDM1190-02

北京中显电子有限公司　010-82626833

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1. Scope

This specification defines general provisions as well as inspection standards for LCD module supplied by DALIAN SANSON INFORTECH CO.,LTD.

If the event of unforeseen problem or unspecified items may occur, please contact the nearest supplier or our company.

2. Warranty

Module products manufactured to this specification shall be capable of meeting all characteristics for a minimum period of 12 months from the date of shipping from DALIAN SANSON INFORTECH CO., LTD. when stored or used as specified under normal conditions within the contents of these sheets.

3. Features

3-1 Features:

Display Mode: Reflective and positive type
TN LCD

Display Color: Display Dots: Black
Background: Gray

Display Format: Digits

Input Data: Serial

Driving method: Static

Viewing Angle: 6 o'clock

3-2 Mechanical Specifications:

Item	Specifications	Unit
Dimensional Outline	72.8(W)×35.5(H) ×10.0 Max.(T)	mm
Number of Dots	4-bit digits	—
Viewing Area	54.2(W)×24.0(H)	mm
Weight	Approx. 50	g

3-3. Absolute Maximum Rating:

Item		Symbol	Min.	Max.	Unit	Note
Supply Voltage	Logic	Vdd	-0.3	7.0	V	Vss=0V
	LCD drive	Vop	—	Vdd	V	
Input Voltage		Vi	-0.3	Vdd+0.3	V	Vss=0V
Operating Temperature		Top	0	55	℃	
Storage Temperature		Tstg	-20	70	℃	
Humidity		—	—	90	%RH	

3-4. Electrical Characteristics:

3-4-1. Electrical Characteristics Note: **<1>** Duty =static **<2>** All dots on static state

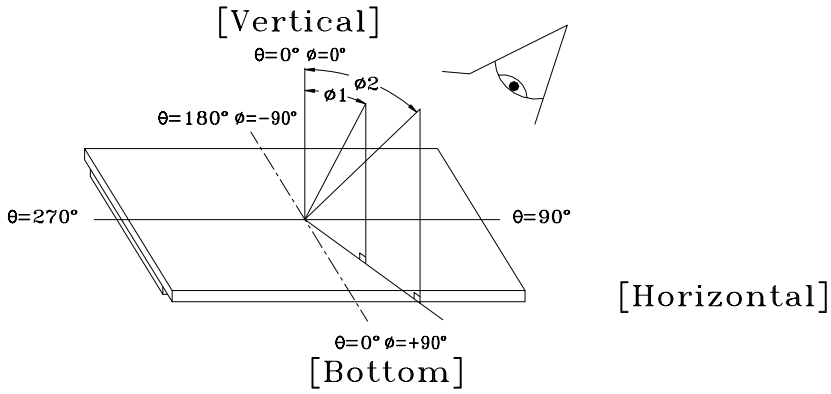
Item		Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	Vdd		4. 5	5.0	5. 5	V
	LCD drive	Vop		—	Vdd	—	
Input Voltage	"H" Level	Vih	Vdd=5V±5%	0.8Vdd	—	Vdd	
	"L" Level	Vil		0	—	0.2Vdd	
Output Voltage	"H" Level	Voh	Vdd=5V±5%	Vdd-0.3	—	Vdd	
	"L" Level	Vol		0	—	0.3	
Frame Frequency		Fflm	Vdd=5V	70	75	80	Hz
Current Consumption	Logic	Idd	Vdd=5V Fflm=75Hz	—	1	1.0	mA
	LCD drive	Iee		—	—	—	
LCD Driving Voltage (Recommended Voltage)		Vop	Ta= -10℃ ϕ=0°, θ=0°	—	5.0	—	V
			Ta= 25℃ ϕ=0°, θ=0°	4.5	5.0	5.5	
			Ta= 60℃ ϕ=0°, θ=0°	—	5.0	—	

3-5. Electro-optical Characteristics:

Item		Symbol	Temp.	Conditions	Min.	Typ.	Max.	Unit	Note
LCD Driving Voltage (Recommended voltage)		Vop	-10℃	ϕ=0°, θ=0°	—	5.1	—	V	1,2,5
			25℃		—	5.0	—		
			60℃		—	4.9	—		
Response Time	Rise Time	tr	0℃	ϕ=0°, θ=0°	—	1500	2000	mS	1,3,5
			25℃		—	150	200		
	Decay Time	td	0℃		—	3000	3500		
			25℃		—	200	250		
Viewing Angle		Δϕ	25℃	Vertical	-35	—	35	deg.	1,4,5
				Horizontal	-30	—	30		
Contrast Ratio		K	25℃	ϕ=0°, θ=0°	5.0	20	—	—	1,5,6

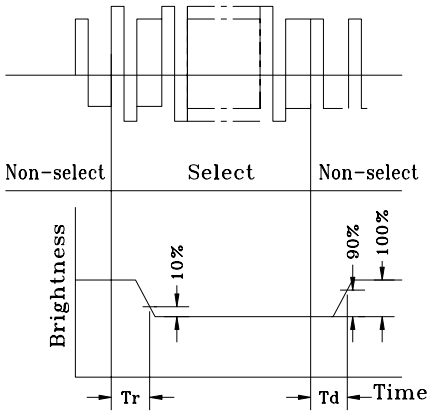
Note: <1> Definition of ϕ and θ

<2> Contrast ratio higher than 2 ($k \geq 2$) can be obtained in this voltage range.

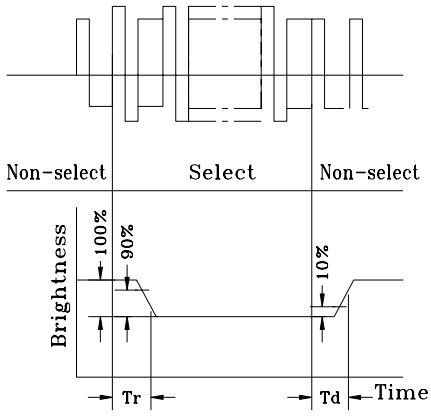


Note: <3>Definition of response time wave form

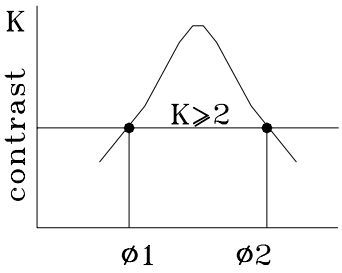
Positive Display



Negative Display

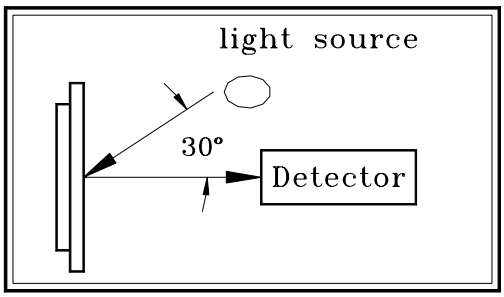


Note: <4>Definition of viewing angle
(ΔΦ) ΔΦ=|Φ1-Φ2|



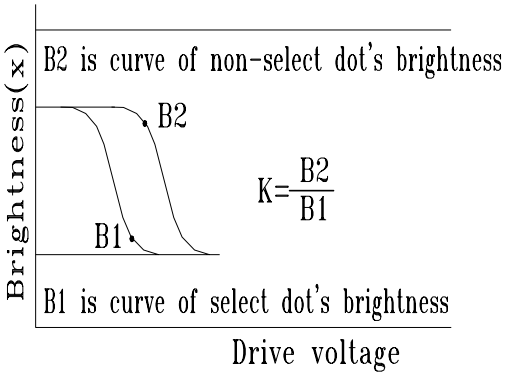
Viewing angle

Note: <5> Optical measuring system
temperature regulated chamber

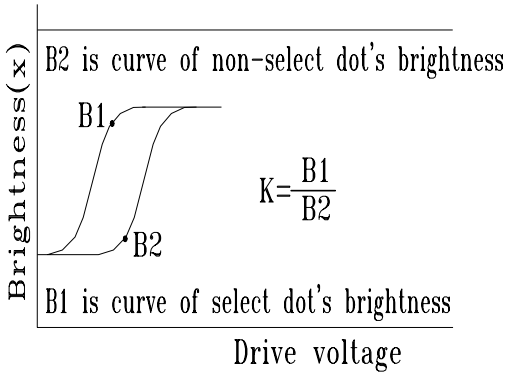


Measuring equipment: DMS
(Made in AUTRONIC)

Note: <6> Definition of Contrast Ratio(K)



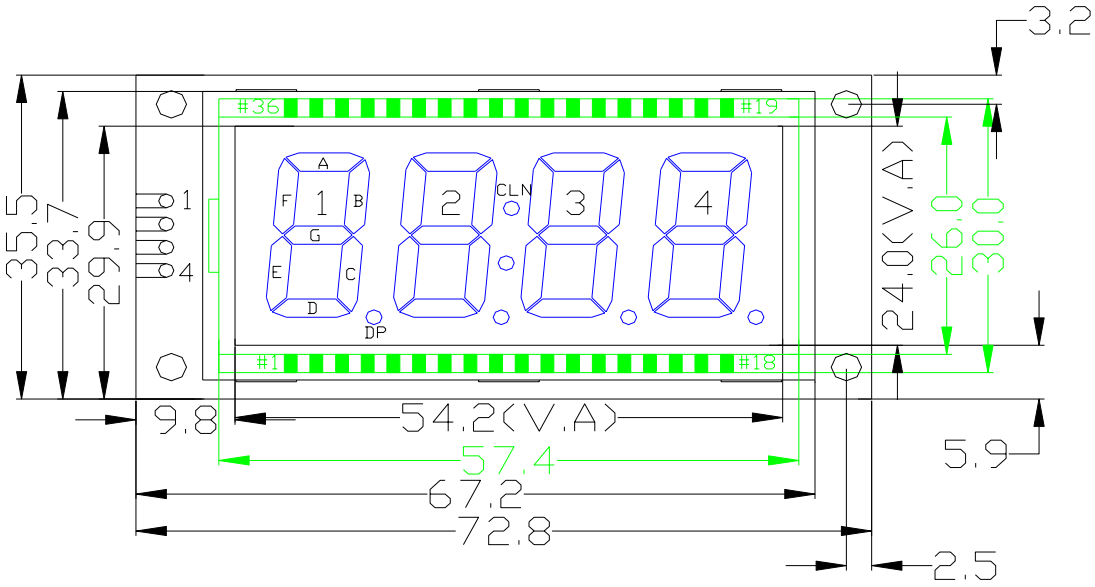
Positive Display



Negative Display

$$\text{Contrast Ratio (K)} = \frac{\text{Brightness of non-selected dot (B2)}}{\text{Brightness of selected dot (B1)}}$$

4．Dimensional Outline

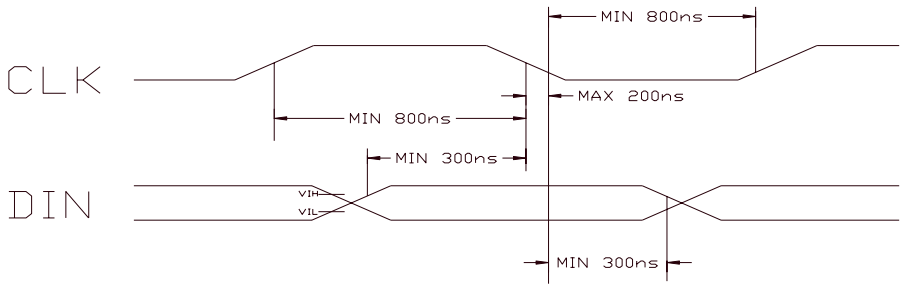


5．I/O Terminal

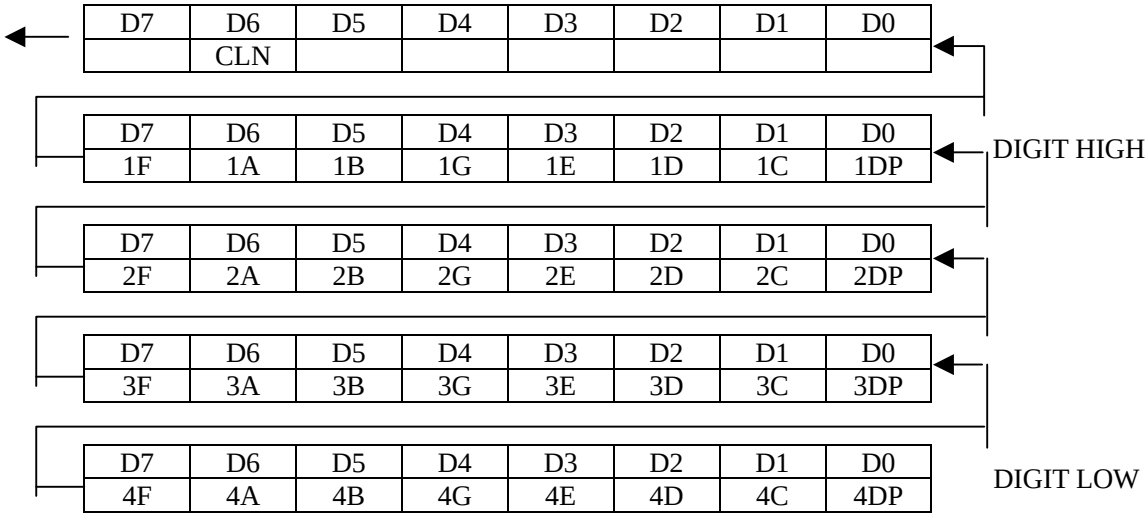
5-1. I/O Connection:

Pin No,	Symbol	Function
1	VDD	Power supply for logic (+5V)
2	DI	Serial data input
3	Vss	Signal ground (GND)
4	CL	Serial clock input

5-2 Signal Timing Diagram:



5-3 Data input direction :



6、Quality Level

6-1 Inspection Conditions

6-1-1 The environment conditions for inspection shall be as follows.

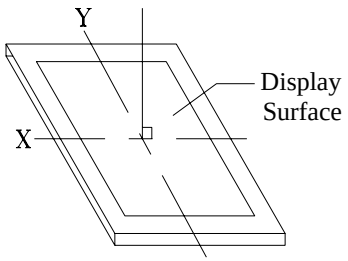
Room temperature : 20±3 °C

Humidity : 65±20%RH

6-1-2 The external visual inspection

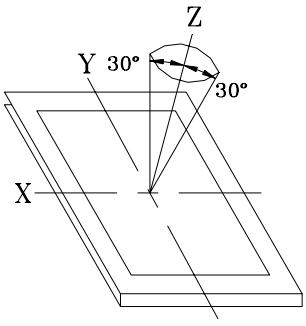
The inspection shall be performed by using a single 20W fluorescent lamp for illumination and the distance from LCD eyes of the inspector should be 30cm or more.

6-1-3 (1) Light method



Fluorescent lamp set the perpendicular to the display surface

(2) Inspection distance and angle



Inspction should be performed withen⌽(⌽is usually 30°)from Z axis to each X and Y axis.
Inspection distance of any direction withen⌽ must be kept 30± 5cm to the display surface.

6-2 Sampling procedures for each item's acceptance level table

Defect type	Sampling procedures	AQL
Major defect	MIL-STD-105D Inspection level Ⅰ Normal inspection Single sample inspection	Q/ED-01-98(Ⅱ)
Minor defect	MIL-STD-105D Inspection level Ⅰ Normal inspection Single sample inspection	Q/ED-01-98(Ⅱ)

6-3 Classification of defects

6-3-1 Major defect

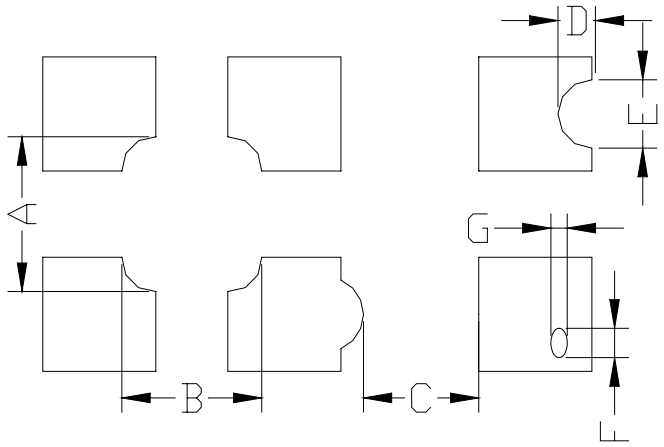
A major defect refers to a defect that may substantially degrade usability for product applications.

6-3-2 Minor defect

A minor defect refers to a defect that is not considered to substantially degrade product applications, or a defect that deviates from existing standards almost unrelated to the effective use of the product or it's operation.

6-4 Incoming Inspection standards

<table>
<tr><th>ITEM</th><th>Criterion for defects</th><th>Defect type</th></tr>
<tr><td>1) Display on inspection</td><td>(1)Non display
(2)Vertical line is deficient
(3)Horizontal line is deficient
(4)Cross line is deficient</td><td>Major
Major
Major
Major</td></tr>
<tr><td>2)Black/Write spot</td><td><table><tr><th>Size Φ(mm)</th><th>Acceptable number
Ignore(note)</th></tr><tr><td>Φ≤0.3</td><td>3</td></tr><tr><td>0.3<Φ≤0.45</td><td>1</td></tr><tr><td>0.45<Φ≤0.6</td><td>0</td></tr><tr><td>0.6<Φ</td><td></td></tr></table>(Note) NG if four or more spot crowd together</td><td>Minor</td></tr>
</table>

<table>
<tr>
<td>3)Black/Write line</td>
<td>
<table>
<tr><th>Length (mm)</th><th>Width (mm)</th><th>Acceptable number</th></tr>
<tr><td>L≤10</td><td>W≤0.03</td><td>Ignore</td></tr>
<tr><td>5.0≤L≤10</td><td>0.03<W≤0.04</td><td>3</td></tr>
<tr><td>5.0≤L≤10</td><td>0.04<W≤0.05</td><td>2</td></tr>
<tr><td>1.0≤L≤10</td><td>0.05<W≤0.06</td><td>2</td></tr>
<tr><td>1.0≤L≤10</td><td>0.06<W≤0.08</td><td>1</td></tr>
<tr><td>L≤1.0</td><td>0.08<W</td><td>follows 2)point defect</td></tr>
</table>
Defects separate at internal of 20mm each other
</td>
<td>Minor</td>
</tr>
<tr>
<td>4)Display pattern</td>
<td>


<table>
<tr><td>(A+B)/2≤4.5</td><td>0<C</td><td>(D+E)/2≤0.35</td><td>(F+G)/2≤0.35</td></tr>
</table>
Note 1)Up to 3 damages acceptable
2)NG if there are two or more pinholes per one digit
</td>
<td>Minor</td>
</tr>
<tr>
<td>5)Spot-like contrast irregularity</td>
<td>
<table>
<tr><th>Size φ(mm)</th><th>Acceptable number</th></tr>
<tr><td>φ≤0.7</td><td>Ignore</td></tr>
<tr><td>0.7<φ≤1.0</td><td>3</td></tr>
<tr><td>1.0<φ≤1.5</td><td>1</td></tr>
<tr><td>1.5<φ</td><td>0</td></tr>
</table>
Note 1)Conformed to limit samples.
2)Defects separate at intervals of 30mm each other.
</td>
<td>Minor</td>
</tr>
<tr>
<td>6)Bubble in polarizer</td>
<td>
<table>
<tr><th>Size φ(mm)</th><th>Acceptable number</th></tr>
<tr><td>φ≤0.40</td><td>Ignore</td></tr>
<tr><td>0.40<φ≤0.65</td><td>3</td></tr>
<tr><td>0.65<φ≤1.20</td><td>1</td></tr>
<tr><td>1.20<φ</td><td>0</td></tr>
</table>
</td>
<td>Minor</td>
</tr>
<tr>
<td>7)Scratches and dent on</td>
<td>Scratches and dent on the polarizer shall be in the accordance with “2) Black/Write spot, 3)Black/Write line”.</td>
<td>Minor</td>
</tr>
</table>

the polarizer		
8)Strains on LCD panel surface	Strains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning too.	Minor
9)Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.	Minor
10)Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.	Minor
11)Bezel appearance	Rust and deep damage which are visible in the bezel is rejectable.	Minor
12)Defect of the land surface contrast (Poor soldering)	Evident crevices which is visible are rejectable.	Minor
13)Parts mounting	(1)Failing to mount parts (2)Parts not in the specifications are mounted (3)Polarizer, for example, is reversed	Major
14)Parts alignment	(1)LSI, IC lead width is more than 50% beyond pad outline (2)Chip component is off center and more than 50% of the leads is off the pad outline	Minor Minor
15)Conductive foreign matter (Solder ball, Solder hips)	(1)$0.45<\phi, N\geq 1$ (2)$0.30<\phi\leq 0.45, N\geq 1$ (3)$0.50<L, N\geq 1$ ϕ: Average diameter of solder ball (unit: mm) L: Average length of solder chip (unit: mm)	Major Minor Minor
16)PCB pattern damage	(1)Deep damage is found on copper foil and the pattern is nearly broken (2)Damage on copper foil other than (1) above	Major Minor
17)Faulty PCB correction	(1)Due to PCB copper foil pattern burnout, the pattern is connected, using a jumper wire for repair: two or more places are corrected per PCB (2)Short circuited part is cut, and no resist coating has been performed	Minor Minor
18)Bezel claw	Bezel claw missing or not bent	Minor
19)Indication on name plate (sampling indication label)	(1)Failure to stamp or label error, or not legible (2)The separation is more than 1/3 for indication discoloration, in which the characters can be checked.	Minor Minor

7、Reliability

7-1 Life time

50,000Hrs (25 ° C in the room without ray of the sun)

7-2 Items of reliability

ITEM	Condition	Criterion
1)High temperature operating	60 ° C 96 hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value ±10% Total current consumption should be below double of initial value
2) Low temperature operating	-20 ° C 96 hrs	No cosmetic failure is allowable. Contrast ratio should be between initial value ±10% Total current consumption should be below double of initial value
3) Humidity	40 ° C 90%RH, 96 hrs	
4) High temperature	70 ° C 96 hrs	
5)Low temperature	-30 ° C 96 hrs	
6) Thermal shock	25 ° C → -30 ° C → 25 ° C → 70 ° C 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	
7) Vibration	10~55~10hz amplitude: 1.5mm 2hrs for each direction (x, y, z)	No defects in cosmetic and operation function are allowable. Total current consumption should be below double of initial value

8、Handling precautions

8-1 Mounting method

The LCD panel of DONGFU COLOR CRYSTAL DISPLAY Co., Ltd. module consists of two thin glass plates with the polarizers which easily get damaged.

And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be used when handling the LCD modules.

8-2 Caution of LCD handling and cleaning

When cleaning the display surface, use soft cloth which solvent [recommended below] and wipe lightly.

- Ethhyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketene

- Aromatics

8-3 Caution against static charge

The LCD module use C-MOS LSI drives. So we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and Ground your body, work/assembly areas, assembly equipment to protect against static electricity.

8-4 Packing

- Module employ LCD elements, and must be treated as such.
  Avoid intense shock and falls from height.
- To prevent module from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

8-5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
  An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.
  However those phenomena do not mean manufacture or out of order with LCD's , which will come back in the specified operating temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A sight dew depositing on terminals is a cause for electro-chemical reaction resulting in the terminal open circuit.
  Usage under maximum operating temperature, 50% RH or less is required.

8-6 Storage

In the case of storing for a long period of time [for instance, for years] for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it, and with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is, keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us.]

8-7 Safety

- It is recommended to crash damaged or unnecessary LCD's into pieces and wash

off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.

- When any liquid leaked out of a damaged glass cell comes in the contract with your hands, please wash it off well with soap and water.

9、Precaution for use

9-1 A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity.

Judgement by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

9-2 On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in the specifications.
- When a new problem is arisen , which is not specified in the specifications.
- When an inspection specifications change or operating condition change in customer is reported to SDD, and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.